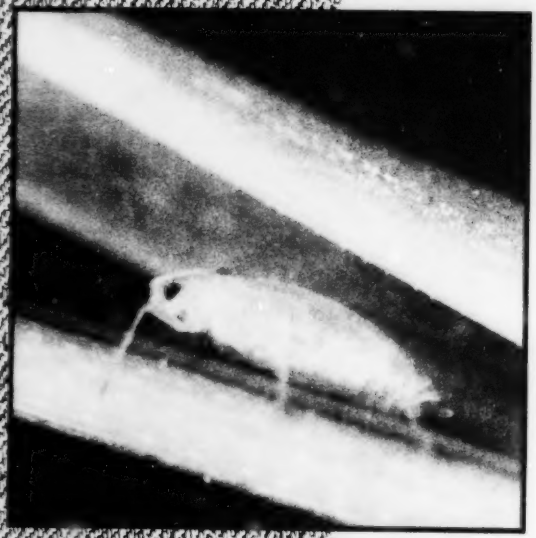
Saskatchewan
Agriculture
and Food



Insect Control in Field Crops 1991

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General

This publication contains the 1991 recommendations for insect control on **cereals** (wheat, barley, oats and rye), **oilseeds** (canola, mustard, flax and sunflowers), **forages** (alfalfa, sweetclover) and **pulses** (peas and lentils).

The information contained in this publication does not supersede the information contained on the product's label. Should there be a discrepancy between the recommendation summaries in this publication and that provided on the product's label, the label recommendations should be adhered to.

Insecticide recommendations are based on those established by the Western Committee on Crop Pests and the Saskatchewan Advisory Committee on Crop Protection. Recommended insecticides have been selected on the bases of their effectiveness, cost and safety, and are not intended to be a comprehensive list of registered insecticides. Other insecticides may be used, provided the product label carries a recommendation for the control of the insect on that specific crop.

The information within the publication is arranged alphabetically by insect with a brief comment on the insect's life cycle and procedures that may assist in its control. A more detailed description of an insect's life cycle may be obtained from, The Guide to Farm Practice or Insect Pests of the Prairies.

Insect forecasts and surveys are conducted annually by Saskatchewan Agriculture and Food for a number of insects to monitor changes in their populations from year to year. These surveys provide a preliminary indication of whether or not a potential for an outbreak exists and the general area of the province that is most likely to be affected by those pests.

Since insect populations are affected by weather factors, parasites, predators, diseases, and the cultural practice employed by producers, it is extremely difficult to accurately predict changes in insect populations over large areas. When interpreting insect forecasts, it is important to recognize that the forecasts are not for individual fields and that these predictions are subject to considerable change depending upon variables which may either intensify or diminish the forecast considerably.

The results of these surveys can be obtained by contacting your local Extension Agrologist (Ag. Rep.).

Field inspections are an essential part of preventing insects from destroying crops. Visual inspections of a crop from a distance often fails to detect insect infestations until the insects have already caused substantial damage to crops. Once a potential insect problem is identified, it may require that an insecticide be applied to prevent substantial crop damage. Whenever possible, this guide indicates the insect population level where economic damage is likely to occur and the application of insecticides should be considered.

USING INSECTICIDES

Insecticide Toxicity

Insecticides are substances that have been selected for their ability to kill insects. They do so by interfering with an insect's vital life processes. Unfortunately, many of these insecticides are not very selective and may cause similar effects on other animals including man if undue exposure occurs. Such effects may occur as a result of a single exposure or from repeated exposure to small quantities that may have cumulative effects.

When handling insecticides, extreme caution should be taken to prevent exposure through prolonged contact with the skin, inhalation, or ingestion by mouth.

An insecticide's toxicity is usually expressed in terms of a single dose which if ingested orally or applied to the skin, will result in the death of half of the animals to which it is given. This value is referred to as the LD_{50} of the insecticide. The smaller the LD_{50} value, the more toxic the insecticide is. This toxicity is expressed symbolically on every insecticide container with a skull and crossbones enclosed within one of the traffic symbols used to denote danger, warning, or caution.

The danger symbol enclosing the skull and cross-bones indicates that if seven drops to one ounce of the insecticide is swallowed or if seven drops to three ounces are absorbed through the skin it could be fatal to a person weighing 150 pounds. When using insecticides bearing this symbol, full protective clothing including a respirator, goggles, and rubber gloves should be worn.

The warning symbol enclosing the skull and crossbones indicates that if one to three ounces of insecticide are swallowed or if three to seven ounces are absorbed by the skin it could be fatal to a person weighing 150 pounds. When using insecticides bearing this symbol, full protective clothing including goggles, and rubber gloves should be worn.

The caution symbol enclosing a skull and crossbones indicates that if three to eight ounces of insecticide are swallowed or if seven to 16 ounces are absorbed by the skin it could be fatal to a person weighing 150 pounds. When using an insecticide bearing this symbol protective clothing including rubber gloves should be worn.

The absence of a hazard symbol on an insecticide label indicates that the material has an extremely low toxicity to mammals. Nevertheless protective clothing should be worn when using it.

Steps to chemical safety

The first step to the safe use of insecticides comes with the realization that insecticides are hazardous materials and their improper use may have serious consequences. When using insecticides always:

(1)**Read the Label** - Insecticides should not be used until the information on the label has been read and understood. If the label is missing or incomplete, do not use the insecticide. Every direction on the label should be carefully followed.

The label contains the following information:

- the name and amount of the toxicant,
- procedures to be followed while handling,
- a warning symbol indicating the appropriate human toxicity,
- crops which can be treated,
- volume of water to be applied,
- preharvest intervals,
- directions for storage,
- directions for container disposal, and
- the antidote in case of poisoning.

(2) **Obtain and Use Proper Protective Clothing** - Insecticides should be handled with extreme caution. It is essential that the appropriate safety equipment be worn.

When handling insecticides, you should wear a clean long-sleeved shirt and long-legged trousers, a coverall-type of garment (preferably of the slash resistant or rubberized type), a hat, rubber gloves, and a respirator containing cartridges designed for use with organic pesticides, bearing the N.I.O.S.H. code number TC-23C.

To receive the maximum benefit from the protective equipment:

- Trouser cuffs should be worn over the rubber boots and the cuffs of the rubberized gloves should be turned back.
- The applicator should be clean shaven.
- Respirators should be cleaned after use in soapy water.
- The cartridges in the respirator should be replaced after about **eight hours of use or sooner if insecticide odour is detected .**

Frequently, respirators are not properly used. Respirators will not be effective in protecting the applicator from toxic fumes unless they contain the appropriate cartridges and are used properly.

The cartridges supplied with the respirator should be those that are approved for use with organic vapours. Cartridges with a N.I.O.S.H. Code **No. TC-23C** should be the only cartridges used. Cartridges without this code number will not provide adequate protection.

(3) **Mix and Handle Insecticides Carefully** - The greatest exposure to insecticides occurs during the mixing, loading and handling process. Before mixing insecticides always read the label instructions and wear appropriate protective clothing.

- Persons using insecticides should be prepared for an accident by making sure that soap, water and towels are available at the loading site.

- Aerial applicators should never take part in mixing and loading operations and should stand well away from the area where they are taking place.

- Insecticides should always be mixed outdoors in a place where there is adequate lighting, good ventilation and any possible spills can be cleaned up.

- When pouring insecticides, stand up wind to avoid contaminating yourself.

- Insecticide cans should be held so the spout is at the top. This will help to avoid the splashing and spurting of insecticides while emptying the containers. If the container has an air vent, use it.

- When containers of insecticide are empty, they should be rinsed at least three times and emptied into the sprayer tank.

- If you feel ill while using insecticides, stop work immediately and seek medical attention if necessary.

- Contaminated clothing should be changed immediately.

(4) **Minimize Insecticide Drift** - Effective and safe application requires that the insecticide contact the insect. To ensure that results are not erratic, it is necessary that insecticides do not drift away from the target area. The factors that affect insecticide drift include wind, droplet size, temperature and the distance between the nozzles and the target area. Insecticide drift can be reduced by:

- applying insecticides only when the wind speed is less than 11 km/h (7 mph).

- applying insecticides during early morning or late evening to reduce possible evaporation of the spray and resulting vapour drift.

- placing the spray nozzles at distances above the target that give adequate coverage.

(5) **Dispose of Containers and Clean Up Spills** - Information on chemical disposal and cleanup can be obtained from Saskatchewan Environment and Public Safety, 3085 Albert Street, Regina, Saskatchewan, S4S OB1, Phone 787-6181. In the event of a spill, call the Spill Report Centre, 1 or 112-800-667-7525 (24 hour, toll free).

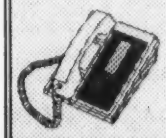
(6) **Decontamination of Equipment** - Spray equipment and personal equipment should be decontaminated immediately after use.

- The sprayer tank should be rinsed with adequate water volume and the tank contents sprayed on the field or emptied carefully to ensure that the residue does not contaminate wells, or endanger the health of animals.

- Rubber gloves should be rinsed in water before proceeding with the removal of other safety equipment.

(7) **Decontaminate Yourself** - The last step in a spray operation is to remove contaminated clothing, shower with adequate amounts of soap and water and put on clean clothing.

For additional information on using and handling insecticides, refer to the publication Pesticide Safety Handbook.



Emergency Response
In case of an Accident

Regina 359 - 4545

Saskatoon 966 - 1010

Alfalfa weevil

Alfalfa weevil is not a serious pest throughout Saskatchewan. The only recent reports of it causing damage to alfalfa have been from south-western Saskatchewan in irrigated alfalfa fields near Maple Creek.

The insect's life cycle begins with the emergence of the adult beetles during late summer. The adult weevil overwinters under grass or debris within the field or in the crowns of the alfalfa plants. In the spring, the adult beetles become active again and seek out suitable sites in which to lay their eggs. The stem of the plants are punctured and the eggs are inserted into the stem. During severe infestations, this may cause serious damage to the alfalfa if the punctures are numerous.

Upon hatching, the young larvae feed for three or four days within the stem and then move up the outside of the plant to feed on the developing leaf buds at the tip of the plant. As the larvae mature they may feed extensively, skeletonizing the leaves.

Control In hay fields, it is sometimes possible to control the damage by harvesting the first cut of hay, rather than by applying insecticide.

Insecticides should be applied in hay fields if there are 5 to 6 larvae per stem or in seed fields when there are 20 to 30 larvae per sweep or 35 to 50 per cent of the foliage tips show evidence of having been fed upon.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa	2 days	**172 mL/ac.** of product in sufficient water for adequate coverage using ground or aerial equipment. **Population suppression only.** Repeat only when necessary.

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	**seed alfalfa only**	20 days	**81 - 101 mL/ac.** of product in 40 to 121 L of water per acre applied with ground equipment. Do not make more than one application per year. **Do not feed harvested forage within 90 days of harvest.** Do not apply at air temperatures above 25°C.
Furadan 480 F carbofuran	alfalfa	7 days	**223 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in 20 L of water per acre when applied with aerial equipment. Do not use within 250 meters of a burrowing owl (*Athene cunicularia*) nest. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.**
Guthion 240 SC azinphos-methyl	alfalfa	21 days	**910 - 1417 mL/ac.** of product in 32 to 80 L of water per acre applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.
Lagon 480 EC dimethoate	alfalfa	7 days	**405 - 506 mL/ac.** of product in sufficient water for good coverage. Aerial application is permitted. Do not graze within 28 days when applied at the highest rates.

Insecticide	Crop	Preharvest interval	Rates & Comments
Malathion 500 EC malathion	alfalfa	7 days	**810 - 1130 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sys-tem 480 EC dimethoate	alfalfa	2 days	**172 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment.

Aphids

Aphids may be found feeding upon cereals, oilseeds, forages and special crops during the summer. The damage they cause to these crops may vary considerably depending on how numerous the aphids are, the particular growth stage the plant is in and whether the aphids inject a toxin into the plant or transmits certain plant diseases.

Generally, those aphids that can overwinter in the Canadian Prairies rarely become numerous until late June or July, and do not usually constitute a serious problem to crops. An exception to this rule is the Russian wheat aphid which may cause significant crop damage throughout the growing season.

Control - Most aphids tend only to be a problem when large populations migrate into Saskatchewan from the United States very early in the spring. Frequently, the use of insecticides can be avoided if crops are seeded early. Early seeded crops tend not to be as heavily infested because they are not as attractive to the aphids and they often mature before aphid populations peek.

Insecticide application to control aphids varies considerably from one aphid species to another. The economic thresholds suggested for the aphids species most frequently observed in Saskatchewan field crops are as follows:

Bird cherry-oat aphid (on cereals) - 70 or more aphids/tiller prior to the boot stage on cereals. In canaryseed, 30 or more aphids/tiller between heading and the soft dough stage has been suggested as the level at which insecticides should be applied but data are not available to support or refute this opinion.

Cabbage aphid (on canola)- thresholds not established.

Corn leaf aphid (on cereals) - 50 or more aphids/plant prior to the boot stage.

English grain aphid (on cereals) - 70 or more aphids/tiller prior to the boot stage.

Green bug (on cereals) - 20 to 30 aphids/plant in the seedling stage, or 50 or more aphids/plant prior to the boot stage.

Pea aphid (on peas) - 2 to 3 aphids/20 cm of plant tip on Century peas and flowers have begun to drop. Trapper peas can withstand considerably higher aphid populations before insecticide use is warranted.

Potato aphid (on flax) - thresholds not established.

Russian wheat aphid (on cereals) - 5 to 10 percent of plants infested prior to the boot stage, 10 to 20 percent of the plants infested during the boot to early flowering or more than 20 percent of the plants infested after flowering or on fall seeded cereals.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa barley canaryseed canola oats rye wheat	2 days 7 days 21 days 28 days 7 days 7 days 7 days	**111 - 172 mL/ac.** of product on peas; **172 mL/ac.** of product on alfalfa, wheat, oats or barley; **202 mL/ac.** of product on canaryseed; or **344 - 364 mL/ac.** of product on canola applied in sufficient water for good coverage using ground or aerial equipment. **Russian wheat aphid - population suppression only.**
Dibrom naled	field beans peas	4 days 4 days	**445 - 890 mL/ac.** of product in sufficient water for adequate coverage. Do not apply when temperature is over 32°C.
Lagon 480 EC dimethoate	peas	3 days	**111 - 172 mL/ac.** of product in sufficient water for adequate coverage. Aerial application is permitted. Do not graze or feed to livestock for 28 days.
Lorsban 4E chlorpyrifos	barley oats wheat	60 days	**404 mL/ac.** of product in at least 40 L of water per acre using ground equipment or in at least 8 L of water per acre using aerial equipment. Use boom configuration that maximizes spray coverage and penetration of the crop canopy.
Malathion 500 EC malathion	barley canaryseed oats rye wheat peas beans	7 days 14 days 7 days 7 days 7 days 3 days 1 day	**607 - 1113 mL/ac.** of product on cereals or **566 mL/ac.** of product on canaryseed applied between heading and the soft dough stage or **708 mL/ac.** of product on peas or **505 - 1102 mL/ac.** of product on beans in sufficient water for adequate coverage. Do not apply at air temperatures below 20°C.

Insecticide	Crop	Preharvest interval	Rates & Comments
Sys-tem 480 EC dimethoate	alfalfa barley oats peas rye wheat	2 days 7 days 7 days 3 days 7 days 7 days	**172 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment. Do not graze or feed to livestock for 28 days.

Armyworm

Armyworm is an occasional pest of cereals and flax. It migrates into Saskatchewan annually in June from the United States and infests cereal crops. Occasionally, they may also cause minor damage to flax crops but only after they have become established on volunteer cereals or wild oats within the crop.

Control - Damage caused by this insect is largely dependant upon the number of moths that deposit their eggs on a crop.

In cereals, the insect causes economic losses primarily by feeding upon the leaves of the crop but head clipping occurs occasionally and can cause extensive loses.

To estimate armyworm densities, field inspections should occur in late June or early July especially in areas where the crop has lodged. Fields should be inspected for larvae in the early morning or evening by beating the crop to dislodge the pale green or green and brown striped larvae and then counting the number of larvae that are dislodged from the plants. It is important to search carefully for the dislodged larvae since during the day they frequently hide under debris, lumps of soil, and leaves.

Insecticides should be applied if there are 10 or more larvae per meter^2 in cereals. Economic thresholds have not been established for armyworms in flax.

Insecticide	Crop	Preharvest interval	Rates & Comments
Dylox 420 L trichlorfon	barley oats wheat	21 days 21 days 21 days	**607 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in at least 4 L of water per acre when applied with aerial equipment.
Lannate 480 L methomyl	barley oats wheat	21 days 21 days 21 days	**506 - 911 mL/ac.** of product in 40 to 142 L of water per acre applied with ground equipment or in 16 L of water per acre when applied with aerial equipment.

Insecticide	Crop	Preharvest interval	Rates & Comments
Malathion 500 EC malathion	barley oats rye wheat	7 days 7 days 7 days 7 days	**450 - 1100 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sevin XLR Plus carbaryl	barley oats rye wheat	28 days 14 days 14 days 14 days	**1012 - 2125 mL/ac.** of product applied in sufficient water to give adequate coverage. When wash off resistance is desirable, dilutions greater than 1:39 are not recommended. Aerial application is permitted. **Use 50 mesh (0.3 mm) or coarser screens. Remove all felt filters and agitate tank mixture.**

Barley thrips

Barley thrips are a minor pest of barley, rye, and durum wheat. They overwinter as adult females on Kentucky blue grass and bromegrass around shelterbelts and bluffs. In late May or early June, they feed upon native grasses migrating into barley fields from mid June to early July.

Damage to the crop is caused by the thrips rasping the inner surface of the terminal leaf sheath causing yellowing of the leaves and a loss in yield and the percentage of plump kernels. Infested heads of grain may become trapped in the leaf sheath and exhibit a typical "goose neck" appearance.

Control - Insecticide application to control barley thrips does not appear to be warranted in most situations. However, conclusive information is not available at this time. Often damage caused by thrips to barley can be avioded if seeding is delayed.

Insecticide	Crop	Preharvest Interval	Rates & Comments
Cygon 480 EC dimethoate	barley oats	28 days 28 days	**405 mL/ac.** of product in sufficient water to obtain good coverage, (usually 45 to 111 L per acre) with ground equipment.
Malathion 500 EC malathion	barley	7 days	**450 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sys-tem 480 EC dimethoate	barley	28 days	**405 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in 8 L of water per acre when applied with aerial equipment.

Beet webworm

Beet webworm is an occasional pest of canola, flax, mustard, and peas and a serious pest of sugar beets. It has two generations per year, beginning with the emergence of the moths in early June. The larvae are dark green with two yellow stripes and are normally observed feeding in July and August upon canola, flax or various weeds. Occasionally, beet webworm has caused damage to cereal crops following the use of herbicides to control weeds within the crop or the cultivation of weeds on adjacent summerfallow fields.

Control - To reduce crop damage caused by beet webworm, weeds in and around susceptible crops should be removed to reduce the attractiveness of the field to egg-laying females.

Insecticide application to control beet webworm has occurred in Saskatchewan to control this insect in canola and flax. Insecticides should be applied in canola if larval densities exceed 20 to 30 larvae/metre^2 or in flax if larval densities exceed 10 larvae/metre^2.

Insecticide	Crop	Preharvest interval	Rates & Comments
Dylox 420 EC trichlorfon	canola flax	21 days 21 days	**607 mL/ac.** of product on canola or **607-1113 mL/ac.** of product on flax in sufficient water to provide adequate coverage. Application with aerial equipment is permitted. Do not apply on flax after flowering.
Lannate 480 L methomyl	canola	8 days	**364 - 506 mL/ac.** of product in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Bertha armyworm

Bertha armyworm is a sporadic but serious pest of canola (rape seed) and mustard. It has one generation per year which begins with the emergence of the adult moth about the middle of June. After mating, the female lays the eggs in clusters on the underside of leaves. The larvae vary considerably in their coloration from green to brown or black as they mature.

Control - Larval densities in canola are determined by beating the crop to dislodge the larvae and counting the number of larvae per m^2. When estimating larval densities, it is important to inspect under leaves and any other plant debris since these larvae frequently hide in leaves during the day. Usually, the crop can tolerate a considerable number of larvae without significant crop damage provided the plants have adequate leaf material for the larvae to feed upon.

Insecticides should be applied once there are approximately 20 to 30 larvae per m^2 or as soon as the larvae begin to feed on seed pods.

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	**40 - 61 mL/ac.** of product in 5 to 9 L of water per acre applied with aerial equipment. Apply only once per season. Do not apply at air temperatures above 25°C.
Lannate 480L methomyl	canola flax	8 days 8 days	**346 - 506 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.
Lorsban 4E chlorpyrifos	canola	21 days	**303 - 405 mL/ac.** of product in 20 to 80 L of water per acre applied with ground equipment or 4 to 12 L per acre when applied with aerial equipment.
Ortho Monitor **Monitor 480L** methamidophos	canola	10 days	**233 - 506 mL/ac.** of product in sufficient water to ensure adequate coverage. Do not apply more than twice per season.

Blister beetles

Blister beetles are sporadic pests of forages, canola, faba beans, and a variety of other crops.

The life cycle begins with the emergence of the adult beetles in June. Upon emergence, the beetles may invade cultivated crops and are initially concentrated around the perimeter of the affected crops giving the appearance of being extremely abundant. The adults mate and deposit their eggs. The larval stages of the blister beetles prey upon the eggs of grasshoppers and the larvae of solitary bees.

The Nuttall blister beetle is the largest of the blister beetles and the one most frequently reported feeding on cultivated crops in Saskatchewan. The adult beetle is 0.65 to 1.1 inches in length and metallic green and purple in colour.

Control - Insecticide application to control blister beetles in canola or mustard does not appear to be warranted in most situations. However, it is recognized that blister beetles may cause significant damage to faba beans by feeding upon the flowers and the terminal growing point of the plant.

The population levels at which insecticides should be applied to control blister beetles on canola, faba beans and mustard to prevent economic losses have not been established.

Insecticide	Crop	Preharvest Interval	Rates & Comments
Sevin XLR Plus carbaryl	alfalfa clover	2 days 2 days	**1012 - 1619 mL/ac.** of product in sufficient water to give adequate coverage. When wash off resistance is desirable, dilutions greater than 1:39 are not recommended. Aerial application permitted.

Clover cutworm

Clover cutworm is an occasional pest of cereals, oilseeds, pulse crops, and forages. It has been observed feeding on barley, fall rye, mustard, canola, flax, peas, and a variety of weeds including Russian thistle and kochia.

The life cycle begins in the spring with the emergence of the adult moths, which mate and lays their eggs singly on the appropriate host plants. The eggs hatch and the larvae begin feeding. These larvae may vary considerably in their coloration as they develop and are often improperly identified as Bertha armyworm by the casual observer.

Clover cutworm can be distinguished from Bertha armyworm by the presence of a broad yellowish-pink stripe along each side of the larva and the presences of a pair of black dashes on each larval segment above this stripe. The dashes are visible along the back of the larva. When mature, the larvae may be up to 1.29 inches long. They then enter the soil and pupate. Two complete generation usually occur with a partial third generation possible if the growing season has been long and hot.

Control - Insecticide application to control clover cutworm in canola or mustard should be considered when there are 20 to 30 larvae per meter^2 or as soon as pod damage is observed. In flax, the thresholds are likely to be significantly lower since there is significantly less leaf matter and the larvae may clip the flax stem just below the boll.

Note: Economic thresholds have not been established for this insect in Canada, but because of its similarity in size and behaviour with the Bertha armyworm similar thresholds are considered relevant until experimental data are available.

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola flax mustard	40 days 14 days 14 days	**40 - 61 mL/ac.** of product in 5 to 9 L of water per acre using aerial equipment. Do not apply more than three applications per year on flax (with a maximum of two applications per year by air) or once per season on canola and mustard. Do not apply at air temperatures above 25°C.
Lannate 480 L methomyl	canola	8 days	**364 - 506 mL/ac.** of product in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Cutworms

Cutworms are a serious pest of crops in Saskatchewan. Cutworms overwinter either as eggs or as very small larvae. Crop damage begins within days of crop emergence in spring-seeded cereals and is usually detected on elevated areas within the fields first.

Army cutworms may be a significant problem in fall-seeded cereals and in spring crops seeded before the end of May. They feed above the soil surface but hide under soil debris during the day. Check for army cutworms and feeding damage on volunteer cereals and weeds before seeding and delay seeding until late May.

Pale western and red-backed cutworms cause most of their damage from early June to mid-July in Saskatchewan. The species most often responsible for crop damage is the pale western cutworm. This cutworm is a crop pest only in the more arid regions of the province. It is a frequent crop pest in fields south of a line drawn from Kerrobert through Saskatoon to Broadview.

Control - Moth populations are monitored annually to determine changes in the abundance of cutworms. This forecast indicates only the relative changes in the population and currently is not reliable enough to predict which field will be infested with cutworms each year. Crops should be inspected frequently during May and June looking for notches on leaves and for wilted, severed or missing plants. Cutworm larvae will normally be found below the soil surface and within several inches of the damaged plants. Use a shovel or garden trowel and a soil-sifting screen to determine the number of cutworm larvae present.

In most situations, problems from these cutworms can be minimized by ensuring the summerfallow is kept free of weeds and the soil is allowed to form a crust between mid-August and mid-September when the cutworm moths are laying their eggs. Insecticides should be applied when there are 3 or 4 larvae per m^2 in cereals. Lower densities may cause significant damage in oilseed crops.

Insecticides should be applied in the evening, and the soil surface remain undisturbed for at least five days. Where rate ranges are given, the higher insecticide rates should be used if cutworms are extremely abundant, if the larvae are large, or if the soil conditions are dry. **NOTE: Under dry soil conditions insecticides are likely to give inadequate control.**

Producers who wish to review basic information on cutworms and their control may wish to preview the film entitled, *Pale Western Cutworm*.

Insecticide	Crop	Preharvest interval	Rates & Comments
Ambush permethrin	barley canola flax lentils oats peas rye sunflower wheat		**57 - 121 mL/ac.** of product in sufficient water for good coverage. Aerial application is permitted.
Decis 5.0 EC deltamethrin	barley flax lentils oats wheat	40 days 40 days 40 days 40 days 40 days	**80 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with aerial equipment. Do not allow rangeland cattle to graze treated fields within 1 day of application. A maximum of 2 aerial applications per year. Do not apply at air temperatures above 25°C.
Lorsban 4E chlorpyrifos	barley canola flax lentils oats sunflower wheat	60 days 21 days 21 days 60 days 60 days 90 days 60 days	**354 - 486 mL/ac.** of product in 20 to 81 L of water per acre applied with ground equipment or in 4 to 12 L of water per acre when applied with aerial equipment. Do not apply more than once/season.
Pounce permethrin	barley oats rye wheat	Do not apply after 5 leaf stage.	**73 - 157 mL/ac.** of product per acre in sufficient water to give adequate coverage. Aerial application permitted in 5 to 14 L of water per acre. Do not apply within 15 meters of productive fisheries' water or waterfowl habitats when using ground equipment or within 100 meters when using aerial equipment.

Diamondback moth

Diamondback moth is an occasional, but often serious, pest of canola and mustard.

The annual infestation begins when the adult moths arrive with weather systems from the southern United States. Eggs are laid on the upper and lower surface of the leaves of the canola and mustard plant. After hatching, the larvae burrow into the leaf and begin to feed on cells within the leaf. As a larva grows, it begins to feed on the entire leaf, and may eventually feed on flower petals, flower buds, and seed pods.

Larvae vary slightly in coloration from green to greenish-yellow to yellowish-brown depending upon what portions of the plant they have been feeding upon. When mature, they are about 0.5 inches long and pupate within a loose, lacy cocoon on stems, leaves or seed pods of the plant.

The adult moth emerges within about a week and starts the life cycle over again. There may be several generations a year with peaks in the adult populations being as close as 21 days apart.

Control - Insect densities may be determined by beating infested plants on a hard surface to dislodge the larvae or collecting them in a sweep net. The number of larvae per sweep is considered to be approximately equal to the number of larvae per meter^2.

Insecticides should be applied to control the larval stage of the insect once there are 200 to 300 larvae per meter^2. Lower infestation levels may require treatment when plants are stressed or senesing.

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	**40 - 60 mL/ac.** of product in 5 to 9 L of water per acre applied with aerial equipment. Do not apply more than once per year. Do not apply at air temperatures above 25°C.
Dylox 420 trichlorfon	canola	21 days	**1113 mL/ac.** of product in sufficient water to ensure complete coverage. Aerial application is permitted.
Guthion 420 SC azinphos-methyl	canola	30 days	**223 - 506 mL/ac.** of product in sufficient water for complete coverage.

Insecticide	Crop	Preharvest interval	Rates & Comments
Lorsban 4E chlorpyrifos	canola	21 days	**405 - 607 mL/ac.** of product in at least 8 L of water per acre when applied with aerial equipment. Use boom configuration that gives maximium coverage of the target.
Malathion 500 EC malathion	canola mustard	7 days 7 days	**242 - 324 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.

Flax bollworm

Flax bollworm is an infrequent pest of flax.

The life cycle begins with the emergence of the adult moth in the spring. Eggs are deposited onto the flax plant and a slender green larva with four conspicuous white or yellowish-white stripes emerges and penetrates into the developing boll. Within the boll, the developing larva feeds upon the developing flax seeds. Infested bolls gradually turn brown as the seeds within are consumed by the developing larva. Infested bolls usually stand out clearly among the uninfested green bolls. Often, this is the first indication of an infestation. When fully developed, the 1.5 inch larva enters the soil and pupates. There is only one generation per year.

Control - Insecticide application is recommended when three percent of the flax bolls are infested.

Insecticide	Crop	Preharvest interval	Rates & Comments
Lannate 480 L methomyl	canola flax	8 days 8 days	**364 - 506 mL/ac.** of product in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Flea beetles

Flea beetles are an annual pest of canola and mustard.

Their life cycle begins with the emergence of the adult beetles the previous fall. The beetles feed extensively on the leaves and seed pods of canola, mustard and other cruciferous plants during August and September. They then overwinter beneath grass and debris around the fields and the leaf litter beneath trees and shrubs. In the spring, the adult beetles migrate to the fields and attack the emerging seedlings. Eggs are deposited at the base of the plant and the larvae feed on the roots of the crop. Adult beetles emerge again in August to resume the life cycle.

Control - Insecticides are applied either as a seed dressings or as an in-furrow granules at planting. These insecticides provide some protection to the seedlings for the first several days after emergence. However, if the flea beetles are abundant or the plants are growing under drought conditions a foliar application of insecticide may be necessary if 25 percent of the surface area on the cotyledons is destroyed.

Damage to the nearly mature crop in the fall does not seem to warrant the use of insecticides unless it appears that the seed pods are going to be severely debarked. However, the effect of flea beetles feeding upon seed pods upon seed quality and yield has not been conclusively determined.

Seed treatments

Insecticide (Seed Treatments)	Crop	Preharvest Interval	Rates & Comments
Benolin-R lindane 50% thiram 10% benomyl 6%	canola	planting time seed treatment only.	**800 g of product/25 kg of seed.** Do not get on skin or breathe dust. DO NOT use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same season. Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane, benomyl and thiram. Do not use as food or feed, nor process seed for oil."** **Do not consume alcohol within 24 hours of working with thiram. Consult label for additional restrictions.**

Insecticide (Seed Treatments)	Crop	Preharvest Interval	Rates & Comments
Counter 5G terbufos	canola mustard	planting time seed treatment only.	**2.2 - 4.5 kg of product per acre of seed sown.** The higher rates should be used when using a discer or air seeder to plant the seed or if extreme infestations are anticipated. Adjust seeding rates to sow the combined weight of the seed and insecticide.
Furadan 5G carbofuran	canola mustard	planting time seed treatment only.	**1.8 - 2.2 kg of product per acre of seed sown.** Seed preferable with hoe or press drill. Do not use disc seeding equipment. Harrowing after seeding causes loss of efficiency. Adjust seeding rates to sow the combined weight of the seed and insecticide.
Furadan CR 10 carbofuran	canola mustard	planting time seed treatment only.	**1.13 kg of product per acre of seed sown.** Seed preferable with hoe or press drill. Do not use disc seeding equipment. Harrowing after seeding causes loss of efficiency. Adjust seeding rates to sow the combined weight of the seed and insecticide.
Premiere lindane 40.0% thiram 4.8% thia-bendazole 1.6%	canola	planting time seed treatment only.	**700 mL/25 kg** of seed sown. Do not get on skin or breath dust. Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane, thiabendazole, and thiram for the control of diseases and insects. Do not use as food or feed. Do not sell to oil mills."** **Do not consume alcohol within 24 hours of working with thiram. Consult label for additional restrictions.**

Insecticide (Seed Treatments)	Crop	Preharvest Interval	Rates & Comments
Thiram Plus lindane 75% thiram 10% benomyl 6%	canola	planting time seed treatment only.	**750 g of product/25 kg of seed.** Do not get on skin or breathe dust. DO NOT use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same season. Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane, benomyl and thiram. Do not use as food or feed, nor process seed for oil."** **Do not consume alcohol within 24 hours of working with thriam. Consult label for additional restrictions.**
Vitavax RS flowable carbathiin 45 g/L thiram 90 g/L lindane 680 g/L	canola mustard	planting-time seed treatment only.	**562 mL of product/25 kg of seed.** Unused, treated seed must be labelled as follows: **"This seed has been treated with VITAVAX RS Flowable Seed Protectant - contains carbathiin, thiram and lindane. Do not use for food, feed or oil processing."** **Consult label for additional restrictions.**

Foliar Insecticides

Insecticide (Foliar treatment)	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	**40 mL/ac.** of product in 40 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when using aerial equipment. Do not apply more than once per year using aerial equipment nor within 100 metres of any body of water. Do not apply at air temperatures above 25°C.

Insecticide (Foliar treatment)	Crop	Preharvest interval	Rates & Comments
Decis 5.0 F deltamethrin	canola mustard	14 days 14 days	**40 mL/ac.** of product in 40 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than once per year using aerial equipment or at air temperatures above 25°C. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.**
Furadan 480 F carbofuran	canola mustard	60 days 21 days	**60 - 111 mL/ac.** of product in sufficient water to give adequate coverage. Aerial application permitted. Do not apply more than 111 ml of product per season or within 250 meters of a burrowing owl (*Athene cunicularia*) nest. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.**
Guthion 240 SC azinophos-methyl	canola	30 days	**111 - 223 mL/ac.** of product in sufficient water for complete coverage.
Malathion 500 EC malathion	canola mustard	7 days 7 days	**445 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in at least 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sevin XLR Plus carbaryl	canola	seedling application 28 days post-emergence	**202 mL/ac.** of product in sufficient water to give adequate coverage. Where wash off resistance is required, dilutions of 1:1 to 1:39 are recommended.

Grasshoppers

Grasshoppers are a persistent pest of cereal, oilseed, forage and pulse crops in Saskatchewan.

The life cycle of the economically important species begins in May and continues until all the eggs have hatched, about the middle of June depending on the grasshopper species, soil type, vegetative cover, and weather conditions after the eggs were deposited. The grasshopper nymphs develop through several instars until they become adults during July. Mating and egg laying then proceeds until the end of the season. Grasshoppers may cause varying amounts of crop damage throughout the season. However, the most severe damage usually occurs shortly after hatching, when the crop is sparse, or when grasshoppers move into the crop from adjacent fields as pasture grasses become dormant, forage crops are harvested, and weeds are controlled on summer-fallow fields.

Control - The early destruction of annual weeds using herbicides or conventional tillage practices before grasshoppers emerge is the most effective way to control grasshoppers on summerfallow. In those areas where grasshoppers have emerged before the weeds are controlled or in forage crops being harvested for animal feed, grasshoppers can be controlled economically by using trap strips to concentrate them before applying an insecticide.

Insecticide recommendations are conditional upon the number of grasshoppers, the size of the affected plants and the general conditions under which the plants are growing. If the plants are small and growing under conditions that do not favour plant growth as few as three or four grasshoppers/m^2 may require chemical control. However, when large plants are growing under favourable growing conditions, control may not be warranted until there are seven to nine grasshoppers/m^2. It is important to note that if crop damage occurs before all the grasshoppers have hatched, several applications of insecticide may be required to protect the crop adequately.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa barley oats rye wheat	2-21 days 2-28 days 2-28 days 2-28 days 2-28 days	**172 - 202 or 395 - 405 mL/ac.** of product on cereals, **172 - 202 or 344 - 364 mL/ac.** of product on forage crops or **344 - 364 mL/ac.** of product on canola in sufficient water for good coverage using ground or aerial equipment. Use lower rates only for very low infestations.

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	barley flax lentils oats wheat **pasture** **rangeland** **(beef cattle only)**	40 days 40 days 40 days 40 days 40 days 1 day 1 day	**40 - 61 mL/ac.** applied in 40 to 81 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than three times per year with a maximum of two applications per year with aerial equipment. Do not apply at air temperatures above 25°C.
Decis 5.0 F deltamethrin	barley flax lentils oats wheat **pasture** **rangeland** **(beef cattle only)**	40 days 40 days 40 days 40 days 40 days 1 day 1 day	**32 - 49 mL/ac.** of product in 40 to 81 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than three times per year with a maximum of two applications per year with aerial equipment. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.** Do not apply at air temperatures above 25°C.
Furadan 480 F carbofuran	alfalfa barley clover corn flax mustard oats pasture sunflower wheat	1 day 21 days 28 days 7 days 21 days 21 days 21 days 1 day 60 days 21 days	**111 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment. Application with aerial equipment is permitted. Use sufficient water for adequate coverage. Do not apply more than once per season to flax, mustard, or canola nor more than twice per season to wheat, barley, oats, corn, pastures, alfalfa, sweet clover, roadsides or headlands. Do not use within 250 meters of a burrowing owl (*Athene cunicularia*) nest.

Insecticide	Crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	alfalfa barley clover oats rye wheat	1 day 30 days 21 days 30 days 30 days 30 days	**445 - 709 ml/ac.** of product in at least 32 L of water per acre applied with ground equipment or 16 L of water per acre when applied with aerial equipment. Do not apply more than once per season.
Hopper stopper dimethoate	barley oats rye wheat pasture - beef - dairy	21 days 21 days 21 days 21 days 0 days 2 days	**800 - 1200 g/ac.** bran bait per acre broadcast evenly.
Lagon 480 EC dimethoate	alfalfa	7 days	**405 - 506 mL/ac.** of product in sufficient water for good coverage. Aerial application permitted. Do not graze for 28 days when applied at the highest rate.
Lorsban 480 EC chlorpyrifos	barley canola oats wheat	60 days 21 days 60 days 60 days	**235 - 354 mL/ac.** of product in 20 to 81 L of water per acre applied with ground equipment or 8 to 12 L of water per acre when applied with aerial equipment.
Malathion 500 EC malathion	alfalfa barley canola clover corn flax lentils mustard oats pasture rye wheat	7 days 7 days 7 days 7 days 7 days 7 days 7 days 7 days 7 days 0 days 7 days 7 days	**445 - 708 mL/ac. (688 mL/ac. on lentils)** of product in at least 20 L of water per acre applied with ground equipment or at least 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C. Maximum of 2 applications per season on lentils.

Insecticide	Crop	Preharvest interval	Rates & Comments
Sevin XLR Plus carbaryl	alfalfa barley clover oats pastures rangeland rye wheat	2 days 28 days 2 days 14 days 1 day 1 day 14 days 14 days	**506 - 1012 mL/ac.** of product in sufficient water to give adequate coverage. Where wash off resistance is required, dilutions of 1:1 to 1:39 are recommended. **Remove all felt filters, use 50 mesh (0.3 mm.) or coarser screens, and agitate tank mixture.**
Sys-tem 480 EC dimethoate	alfalfa barley oats rye wheat	7 days 7 days 7 days 7 days 7 days	**172 - 344 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment, or 4 L of water per acre when applied with aerial equipment.

Lygus bug and various other plant bugs

Lygus bug and a variety of other plant bugs are serious pests of alfalfa grown as a seed crop. The lygus bug overwinters as an adult in leaf litter and debris associated with trees, shrubs and "wasteland" outside the alfalfa fields. The adults resume activity in the spring, mate, and lay eggs in the hollow stem of the alfalfa plants. The nymphs take approximately 30 days to mature and the new adults start to appear in the crop about the middle of July. These bugs attack the alfalfa when it is in the bud stage or early bloom causing the buds to shrivel and die.

Recently, lygus bugs have been reported causing damage to canola and mustard by feeding upon the seeds within the developing seed pods.

Control - Crop damage can be minimized by burning of alfalfa stubble in the spring. This will control all plant bugs by destroying the overwintering eggs, except lygus bug, which does not overwinter within the crop.

Insecticide application is recommended when there is an average of one adult lygus bug per two sweeps or five nymphs or adults of other species per sweep net catch.

The control of lygus bug and other plant bugs in alfalfa grown for forage is not recommended.

Economic thresholds for lygus bugs in canola and mustard have not been established.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa	2 days	**445 mL/ac.** of product in sufficient water for good coverage using ground or aerial application equipment.
Decis 5.0 EC deltamethrin	**seed alfalfa only**	20 days	**81 - 101 mL/ac.** of product in 40 to 121 L of water per acre applied with ground equipment. Do not make more than one application per year. **Do not feed harvested feed within 90 days of harvest.** Do not apply at air temperatures above 25°C.

Insecticide	Crop	Preharvest interval	Rates & Comments
Dylox 420 L trichlorfon	alfalfa	14 days	**1113 mL/ac.** of product in sufficient water to ensure thorough coverage. Only one application per cutting.
Lagon 480 EC dimethoate	alfalfa	7 days	**405 - 506 mL/ac.** of product in sufficient water for good coverage. Aerial application is permitted.
Sys-tem 480 EC dimethoate	alfalfa clover	7 days 28 days	**425 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or at least 8 L of water per acre when applied with aerial equipment.

Orange wheat blossom midge

Orange wheat blossom midge is an annual pest of wheat in northeastern and east central Saskatchewan. Economically important infestations have been concentrated in an area north of a line drawn from Prince Albert to Yorkton.

The life cycle begins with the emergence of the adult midge about the last week of June. The midge mates and its eggs are deposited on heads of wheat. The larvae develop while feeding upon the developing seed. By August, larval growth is complete and the larva leaves the plant and forms a larval cocoon in the soil. It remains within this cocoon until conditions are favourable; sometimes this can be for several years.

Control - Forecasts are unavailable to predict which wheat field within the infested areas will be most heavily infested. However, distribution maps are available indicating the areas that have been infested and the general level of infestation.

To detect the presence of this insect in a wheat field, producers must inspect their crop every evening from the time the midge begins to emerge until the crop has flowered.

Insecticide application should be made if there are approximately one or more adult midge per four or five heads of wheat and 75 percent of the wheat heads have emerged from the "boot". Insecticides should be applied in the late afternoon or early evening when air temperatures exceed 15°C and when the wind velocity is less than 10 kmph.

Producers who wish to review basic information on the orange wheat blossom midge and their control may wish to preview the film entitled, *"The Wheat Midge Problem"* or obtain a fact sheet concerning this insect from their Extension Agrologist.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	wheat	21 days	**405 mL/ac.** of product in sufficient water to give adequate coverage using ground or aerial equipment. Repeat after 3-7 days if adult midge population persists.

Insecticide	Crop	Preharvest interval	Rates & Comments
Furadan 480 F carbofuran	wheat	21 days	**111 mL/ac.** of product in 20 L of water per acre applied with ground equipment. Application by aerial equipment is permitted. Use sufficient water to ensure thorough coverage. Repeat after 3-7 days if adult midge population persists.
Lorsban 4E chlorpyrifos	wheat	60 days	**336 - 405 mL/ac.** of product in 20 to 81 L of water per acre applied with ground equipment or **405 mL/ac.** of product in 4 to 12 L of water per acre when applied with aerial equipment.

Painted lady butterfly

Painted lady butterfly is an occasional pest of canola, mustard, and sunflowers.

There may be two or more generations per year once the butterfly arrives in Saskatchewan from the southern United States. The butterfly lays its eggs on a variety of plants including the above crops and a variety of weeds such as Canada thistle and round-leafed mallow.

The larva of this butterfly is sometimes referred to a thistle caterpillar because of its preference for Canada thistle as a host plant. The larva is black, spiny and up to 1.5 inches in length. Often, it will web the upper surface of the host plant's leaves together to protect itself from various predators and forages from within this protective webbing.

When mature, the larva attaches itself to the underside of a leaf or stem and forms a chrysalis and pupates. When development is complete, the adult butterfly emerges from the chrysalis and the cycle continues until fall when the adults migrate south.

Crop damage caused by this insect is primarily related to the feeding activity of the larval stage but, the droppings left behind by the caterpillars are frequently harvested with mustard seed and must be removed before the crop can be sent to market.

Control - Insecticide application may be warranted to control this insect on sunflowers but data are unavailable to establish what population levels warrant control.

Insecticide	Crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	canola	30 days	**460 mL/ac.** of product in sufficient water for complete coverage. Aerial application is permitted.
Supracide 25 EC methidathion	canola	30 days	**850 - 1133 mL/ac.** of product in at least 45 L of water per acre applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Red turnip beetle

Red turnip beetle is an occasional pest of canola and mustard. The insect has one generation per year and overwinters in the egg stage under clumps of soil and debris. In May, the eggs hatch and the black, slow moving larvae feed on various cruciferous plants. Upon completion of the larval stage, the larvae enters the soil and pupate. The adult beetles subsequently emerge and resume feeding.

Crop damage from this insect is primarily caused by the feeding activity of adult beetles as they invade the crop from adjacent fields. The damage usually occurs after the adults have consumed the volunteer canola and mustard in the adjacent fields or when the host plants have been destroyed by cultivation or herbicide application.

Control - Damage to canola and mustard crops can be minimized by (1) destroying volunteer cruciferous plants in the spring to starve the young larvae and (2) by not seeding canola adjacent to fields that have been heavily infested the previous year.

Insecticide application should be applied to crop margins as soon as beetles become numerous.

Insecticide	Crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	canola	30 days	**223 - 344 mL/ac.** of product in sufficient water for complete coverage. Aerial application is permitted.
Furadan 480 F carbofuran	canola mustard	30 days 30 days	**111 mL/ac.** of product in sufficient water for complete coverage. Aerial application is permitted. Do not use within 250 meters of a burrowing owl (*Athene cunicularia*) nest.
Supracide 25 EC methadithion	canola	30 days	**404 mL/ac.** of product in 45 L of water per acre applied with ground equipment or in at least 9 L of water per acre when applied with aerial equipment.

Sunflower beetle

Sunflower beetle is a cream coloured beetle with dark brown stripes on its outer wings (the last stripe resembling an exclamation mark) and brown patch across its thorax. This beetle is often confused with the Colorado potato beetle.

The beetle has one generation per year. The eggs are laid singly on the stem of the plant or on the underside of the leaves. The eggs hatch within a week and the yellowish-green, humpbacked larvae begin feeding on the leaves and floral bracts during the night and hide in the bracts during the day. When mature, the larvae drop to the ground and pupate in the soil.

Control - Crop damage caused by this insect can be reduced with late fall cultivation which may expose beetles to the elements and cause greater winter mortality.

Insecticide application is recommended when there is 1 adult beetle per two or three seedlings at the two to six leaf stage in June or 10 or more larvae per plant during the summer.

Insecticide	Crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	sunflower	See comments	**445 mL/ac.** of product in at least 32 L of water per acre. Do not apply more than twice per season nor after sunflower heads have formed.
Furadan 480 F carbofuran	sunflower	60 days	**111 ml/ac.** of product in at least 40 L of water per acre applied with ground equipment. Do not apply after plants are more than 60 cm in height nor after heads have started to form. Do not use within 250 meters of a burrowing owl (*Athene cunicularia*) nest. **Aerial application not effective.**

Insecticide	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	sunflower	70 days	**40 mL/ac.** of product in 40 to 81 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when applied with aerial equipment. Evening application preferable. Do not apply more than once per year. Do not apply at air temperatures above 25°C.
Thiodan 400 EC endosulfan	sunflower	60 days	**570 mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in 4 L of water per acre when applied with aerial equipment.
Supracide 25 EC methidathion	sunflower	50 days	**405 - 850 mL/ac.** of product in at least 45 L of water per acre applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Sunflower moth

Sunflower moth is an occasional pest of sunflowers. The moth migrates into Saskatchewan from the southern United States during early July.

Female moths deposit their eggs only in newly-opened sunflower blooms. The larvae hatch and feed on pollen and later move on to destroy developing seeds. Upon completion of the larval stage, they enter the soil, pupate and subsequently emerge in September.

Control - Insecticides should be applied to oilseed sunflowers if moths are present (as indicated by pheromone traps) and at least 10 percent of the blooms are opening. If high moth catches continue, a repeat application may be required at five day intervals.

Insecticide	Crop	Preharvest interval	Rates & Comments
Supracide 25 EC methidathion	oilseed sunflower	50 days	**850 - 1133 mL/ac.** of product in at least 45 L of water per acre when applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Sweetclover weevil

Sweet clover weevil is a persistent pest of sweet clover. The adults emerge in late summer and feed extensively from mid-August until mid-September. The adults overwinter in leaf litter and debris around the field and reinvade the crop in the spring. Eggs are deposited at the base of the plants and the larvae feed and develop on the roots of the plant.

Control - Infestations can be reduced by: (1) establishing new stands of sweet clover as far as possible from second-year sweet clover using high quality scarified seed, planted no deeper than 25 cm, to ensure quick germination, and (2) cultivating second-year sweet clover immediately after it has been cut for hay or silage to destroy the larval and pupal stages prior to the emergence of the next generation adults.

Insecticides should be applied in first year stands if there is one weevil per three seedlings under normal conditions or one weevil per five seedlings under dry conditions.

In second year stands of sweet clover, insecticides should be applied if there are 9 to 12 weevils per plant.

Insecticide	Crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	clover	28 days	**344 - 445 mL/ac.** of product in sufficient water for good coverage using ground or aerial equipment.
Guthion 240 SC azinphos-methyl	clover	21 days	**910 mL/ac.** of product in at least 32 L of water per acre applied with ground equipment or at least 16 L of water per acre when applied with aerial equipment. A second application is permitted at a 7 to 14 day interval.

Insecticide	Crop	Preharvest interval	Rates & Comments
Malathion 500 EC malathion	clover	7 days	**570 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sys-tem 480 EC dimethoate	clover	7 days	**344 - 404 mL/ac.** of product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment.

Wireworms

Wireworms are a pest of cereal grains and grasses throughout Saskatchewan.

The life cycle begins with the emergence of the adult beetle in late July. It then overwinters in the soil and becomes active in the spring. Adults mate and lay eggs around the roots of grasses. The yellowish brown larvae spend two to six years in the soil feeding on the roots of grasses before pupating and completing their life cycle.

Field infestations usually take several years to develop unless the crop is seeded on land that has been previously under sod.

Crop damage is usually noticed shortly after seeding. Affected plants wither, wilt and die.

The stems of damaged plants appear as if they have been perforated or shredded rather than being severed as is the case when plants have been damaged by cutworms.

The wireworm larvae are not always present by the time the damage is noticed because the larvae move deeper into the soil as the season progresses and the soil becomes warmer and dryer .

Control - Crop damage from wireworms can be minimized by (1) including relatively immune crops such as flax or canola in rotation with cereals, (2) cultivating summerfallow fields as shallow as possible, (3) seeding cereal crops shallow to induce quick germination, and (4) using insecticide.

Cereals planted into fields cropped continuously to cereals, newly-broken sod, summerfallow fields or fields with a previous history of wireworms, should be treated with insecticides for two consecutive years.

Insecticide	Crop	Preharvest interval	Rates & Comments
Mergamma M-N Drill Box lindane 18.75% maneb 37.5%	barley oats rye wheat	Planting time seed treatment only	**barley - 65g/25 kg of seed** **oats - 92g/25 kg of seed** **rye - 56g/25 kg of seed** **wheat - 52g/25 kg of seed** Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane and maneb. Do not use as food or feed."** **Consult label for additional restrictions.**

Insecticide	Crop	Preharvest interval	Rates & Comments
IPCO M-N D.P. Drill Box lindane 18.75% maneb 37.5%	barley oats rye wheat	Planting time seed treatment only	**barley - 65g/25 kg of seed** **oats - 92g/25 kg of seed** **rye - 56g/25 kg of seed** **wheat - 52g/25 kg of seed** Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane and maneb. Do not use as food or feed."** **Consult label for additional restrictions.**
IPCO M-N D.P. Drill Box lindane 18.75% maneb 37.5%	barley oats rye wheat	Planting time seed treatment only	**barley - 65g/25 kg of seed** **oats - 92g/25 kg of seed** **rye - 56g/25 kg of seed** **wheat - 52g/25 kg of seed** Unused, treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane and maneb. Do not use as food or feed."** **Consult label for additional restrictions.**
Vitavax Dual Solution lindane 165 g/L carbathiin 180 g/L	barley oats wheat	Planting time seed treatment only	**75 - 90 mL per 25 kg of barley or wheat seed or 75 mL per 25 kg of oat seed.** Unused,treated seed must be labelled as follows: **"Poisonous to man and animals. This seed has been treated with lindane and carbathiin. Do not use for food or feed.** **Consult label for addition restrictions.**

For Additional Information Contact Your Extension Agrologist.

CITY	EXTENSION AGROLOGIST	PHONE
ASSINIBOIA	Garry Noble	642-3555
BIGGAR	Glenn Barclay	948-2666
CANORA	Brian Sim	563-5604
CARNDUFF	Grant McLean	482-3798
DAVIDSON	Marilyn Ruszkowski	567-2806
ESTEVAN	Brad Hansen	634-0701
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INDIAN HEAD	Ed Tanner	695-2263
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KELVINGTON	Larry Gutek	327-4718
KERROBERT	Brandon Green	834-2323
KINDERSLEY	Barry Rapp	463-2599
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LLOYDMINSTER	Howie Bjorge	825-7632
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MEADOW LAKE	David Cubbon	236-4441
MELFORT	Stu Adam	752-6155
MELVILLE	Vacant	728-2100
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NIPAWIN	Larry Lee	862-1788
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OUTLOOK	Bill Hurd	867-8684
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SWIFT CURRENT	Pat Gerwing	778-8284
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WATROUS	Bryan Doig	946-3395
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